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# *CONTENTS*

<b>1. INTRODUCTION</b>	<b>2</b>
<b>2. SYSTEM REQUIREMENTS</b>	<b>2</b>
<b>3. PACKAGE CONTENTS</b>	<b>2</b>
<b>4. INSTALLING POWERCHUTE</b>	<b>3</b>
4.1 Detailed Installation	3
4.2 Configuration Menu	7
4.3 PowerChute Configuration Parameters	9
4.4 Verify Proper Operation	11
4.5 Removing PowerChute	12
<b>5. POWERCHUTE STRUCTURE</b>	<b>12</b>
5.1 Operational Overview	13
5.1.1 UPS Monitoring Process	13
5.1.2 The PowerChute Log File	14
5.1.3 Command Procedure Files	14
5.1.4 PowerChute Files:	15
<b>6. MODIFYING RUNTIME PARAMETERS</b>	<b>16</b>
<b>APPENDIX A - POWERCHUTE LOG FILE ENTRIES</b>	<b>17</b>
<b>APPENDIX B - INSTALLATION TROUBLESHOOTING</b>	<b>18</b>

## **1. Introduction**

Today, computers are smaller, more common, and less expensive than ever before. Unfortunately, they are still quite vulnerable to power fluctuations. UPS systems for today's computers are readily available, but one crucial element has changed: Many systems today are not attended by trained personnel, so a system supervisor is not always available to bring the system down when power fails.

For this reason, American Power Conversion introduced PowerChute to provide an orderly shutdown of a system in the event of an extended AC power failure. PowerChute offers user notification of impending shutdown, power event logging, and orderly system shutdowns.

## **2. System Requirements**

PowerChute for Open VMS requires that you have the following:

- An APC UPS with a serial port
- A DEC VAX or AXP running Open VMS or VMS (PowerChute supports Open VMS v6.0 and above and VMS v5.1 and above).
- A CD-ROM drive (for AXP systems) or a TK-50 tape drive (for VAX systems)
- A serial port on the system dedicated to PowerChute<sup>1</sup>

## **3. Package Contents**

The PowerChute product contains the following:

- This manual.
- A CD-ROM for AXP systems.
- A TK-50 PowerChute cartridge for VAX systems
- A custom UPS 9-25 pin serial interface cable.

---

<sup>1</sup>PowerChute functionality varies depending on whether the port supports Full Modem Control. See sections 4.1 and 4.3 for more information.

## **4. Installing PowerChute**

Installation of PowerChute requires an understanding of the VMS system configuration. PowerChute can be installed only from the SYSTEM account.

### **4.1 Detailed Installation**

To install PowerChute, perform the following steps.

#### **1. Install the UPS on the VMS system.**

- a. Plug the computer into the UPS.
- b. Plug the UPS into a wall outlet.

**Note:** On most APC UPS Models that have DIP switches, you can set DIP switch #4 to extend the Low Battery warning from 2 minutes to 5 minutes. Consult your UPS Owner's Manual for more information regarding the DIP switches on your UPS.

The switch settings are as follows:

Switch #4 OFF = 2 minutes warning (UPS factory-set default)  
Switch #4 ON = 5 minutes warning

On VMS systems, APC recommends that this be set to 5 minutes.

#### **2. Boot the VMS system. Log in as the SYSTEM user.**

- a. Turn on the UPS, and boot the computer.
- b. Log into the VMS system as SYSTEM.

#### **3. Remove PowerChute from your system.**

If you are upgrading PowerChute, you must first remove the existing copy of PowerChute. See Section 4.5 for instructions on how to remove PowerChute.

If you are installing PowerChute for the first time on your system, proceed to Step 4.

#### **4. Select and configure the serial port that will be used to communicate with the UPS.**

PowerChute requires complete control of the serial port. When PowerChute is configured, it will attempt to determine whether the port

supports full modem control. On some systems, ports which support full modem control will not be recognized as such; this is normal for PowerChute. See the description of the Disable Down Time parameter in Section 4.3, "PowerChute Configuration Parameters" for information about PowerChute operation without full modem control.

Before starting the PowerChute process, you must set seven terminal characteristics for the serial port for proper PowerChute operation. These characteristics are:

NOTYPE_AHEAD	NOBROADCAST	NOAUTOBAUD
PASTHRU	NOMODEM	HANGUP
WRAP		

Use the SET TERM command to set the terminal characteristics of the port until the system is rebooted.

```
SET TERM/PERM/NOTYPE_AHEAD/NOBROADCAST/NOAUTOBAUD/  
PASTHRU/NOMODEM/HANGUP/WRAP
```

Use the SHOW TERM command to confirm settings, as follows:

```
SHOW TERM <port name>
```

To insure that the port is always configured properly before the PowerChute process is started, add the SET TERM statement as shown above to the system startup file.

After the PowerChute process is started, the port changes to TYPE\_AHEAD. This is normal.

**Caution: Do not change the port characteristics while the PowerChute process is running. PowerChute may interpret such a change as a power failure and initiate system shutdown.**

Type the following command line to verify that no process has the port allocated:

```
SHOW DEVICE/FULL <port name>
```

If the owner process id (PID) is not 00000000, that owner process must release the port before installation can continue.



## Terminal Server Ports

You can use a terminal server port to communicate to the UPS by performing the following steps.

- A. In LATCP, create and set up a port. The port name must start with "LTA" (LTA1 is used in this example). The following commands are for a Decserver 200:

```
mcr latcp
latcp>create port lta1
latcp>set port lta1/appl/port=port_1/node=server_1
```

For some terminal servers, you may need to use a "define" as well as a "set" command to store the port setup in the permanent database. Put these commands in SYS\$MANAGER:LTLOAD.COM or whatever command procedure is responsible for setting up terminal server ports at boot time.

- B. Set up the terminal characteristics, as explained earlier in this section..
- C. Log in to the terminal server on another terminal on the same server, through TSM, or through NCP, and set the ACCESS on the port to REMOTE.

```
LOCAL>set priv <password>
LOCAL>set port 1 access remote
LOCAL>define port 1 access remote
```

## 5. Install the signaling cable between the UPS and DEC system.

The cable enclosed is a custom UPS cable designed for use with an APC UPS. You must use this cable for proper operation. On all installations, the main UPS cable connects directly to the UPS; do not use an adapter on the UPS end. At the server end, you can use other adapters, including DB-25 to DB-9 adapters.

Some systems require the following special cables or connectors.

- Systems with RJ-45 ports require a conversion cable available from DEC. Order part number H8585-ab.
- Systems with MMJ-45 ports require a conversion cable available from DEC. Order part number H8575-d.

- If a male to male connector is also required, order part number BN24J-01 from DEC.

## 6. Load and configure the PowerChute software.

- After logging in as `SYSTEM`, insert the tape or CD-ROM into the appropriate drive. Assign a system logical `POWERCHUTE$DIR` pointing to the directory where you want to store the PowerChute software. If you use `SYS$MANAGER`, be sure to use the colon (`SYS$MANAGER:`).

```
ASSIGN/SYSTEM equivalence POWERCHUTE$DIR
```

For *equivalence*, use the absolute path name of the directory where PowerChute will be loaded, including the volume label. Do not include other logical variable names in *equivalence*.

The PowerChute files are stored on the tape or CD-ROM in a backup saveset called `POWERCHUTE`. To copy the files into the `POWERCHUTE$DIR` directory, enter the following commands.

To copy from the TK-50 tape:

```
MOUNT/FOREIGN device
BACKUP/LOG device:POWERCHUTE POWERCHUTE$DIR
DISMOUNT device
```

To copy from the CD-ROM:

```
MOUNT/FOREIGN device
BACKUP/LOG device: [POWERCHUTE]POWERCHUTE.BCK/SAVE POWERCHUTE$DIR
DISMOUNT device
```

Remove the PowerChute tape or CD-ROM from the drive.

- If your system is running a version of VMS earlier than 5.4 you may need to relink the executable.

The object files and command procedure needed to relink the executable are on a second saveset named `BLDPC` on the TK-50 tape. To unload these files and link a new version, enter the commands:

```
BACKUP/LOG tape_device:BLDPC POWERCHUTE$DIR
@LINK_PC
```

These commands create a new version of the PowerChute executables. Once the executables are linked, you can safely delete the following files from the POWERCHUTE\$DIR directory: POWERCHUTE.OLB, POWERCHUTE.OBJ, LINK\_PC.COM.

- c. To initially invoke the PowerChute configuration menu, enter the following commands:

```
SET DEFAULT POWERCHUTE$DIR
@APCSETUP.COM
```

Fill in the appropriate values for the PowerChute parameters. See Section 4.2, "Configuration Menu," and Section 4.3, "PowerChute Configuration Parameters," for more information.

After entering the parameter values, press **F8** to save your parameters to the PowerChute initialization file and to start the PowerChute process.

## 7. Starting PowerChute at reboot time.

When you are satisfied with the operation and cabling, add the following lines to **SYSS\$MANAGER:SYSTARTUP\_V5.COM** (for VMS) or **SYSTARTUP\_VMS.COM** (for OpenVMS) to activate PowerChute automatically when the system reboots. Add these lines **after** you modify the terminal characteristics as described in Step 4 in Section 4.1, "Detailed Installation," earlier in this manual.

```
$ ASSIGN/SYSTEM equivalence POWERCHUTE$DIR
$ @POWERCHUTE$DIR:RUN_PC.COM
```

For *equivalence*, use the absolute path name of the directory where PowerChute will be loaded, including the volume label.

When PowerChute runs, it creates a detached process and runs in that process. When initially created, **SYSS\$MANAGER:SYLOGIN.COM** and the user's login (if run from any user account) will be executed. To avoid execution of the commands in either of these two login files, add the following line at the beginning of the file:

```
$ IF F$MODE( ) .EQS. "OTHER" THEN EXIT
```

See Section 4.4 for information on how to verify that the software is configured properly and that it can communicate with the UPS.

## 4.2 Configuration Menu

You configure the PowerChute parameters through a menu. @APCSETUP.COM calls the PowerChute configuration program, PC\_CONF.EXE. The configuration program displays a menu with the default parameter values already entered, which you can accept or change. The parameters are stored in the file POWERCHUTE\$DIR:PWRCHUTE.INI for subsequent startup operation.

The VAX terminal must be set up with 8 column tabs to ensure proper screen formatting.

To change a parameter value, use the **UP** arrow key, the **DOWN** arrow key, or the **Enter** key to move the cursor to that parameter field, and type in your selection. Use the **Delete** key to remove characters in the field.

PowerChute Configuration			
Serial Port Name:			
Message Delay Time:	5	seconds	
Message Interval Time:	30	seconds	
Disable Down Time:	NO		
Down Time:	300	seconds	
Low Battery Runtime:	30	seconds	
IO Timeout:	2	seconds	
Event Log File Name:			
POWERCHUTE\$DIR:POWERCHUTE.LOG;1			
Event Log Max File Size:	50000	bytes	
Error Log File Name:			
POWERCHUTE\$DIR:POWERCHUTE.ERR			
Event Message File Name:			
POWERCHUTE\$DIR:POWERCHUTE.MSG			
Configure Message Text:	NO		
Configure Command Procedures: NO			
F8 (Control E) - Exit/Save F11 (Control N) - Exit/NoSave			
F15 (Control A) - Help			

**Caution: For your UPS to function properly, the serial port specified as Serial Port Name must meet the requirements described for that field in Section 4.3, "PowerChute Configuration Parameters."**

For more information on any PowerChute parameter, move the cursor to that parameter, and press F15 for Help; or see Section 4.3, "PowerChute Configuration Parameters."

The screen displays errors at the lower left. When the only valid options for a field are YES and NO, a pop up window listing the options is displayed. Move the cursor to the desired option, and press **Enter**.

The function keys are defined as follows:

<b>F15 (Ctrl A)</b>	Provides on-line help about the current entry.
<b>F8 (Ctrl E)</b>	PowerChute validates all input, saves the parameters, and starts the PowerChute process.
<b>F9 or F11 (Ctrl N)</b>	Aborts and exits the configuration program.
<b>Ctrl W or Ctrl L</b>	Refreshes the screen.

**Note:** Because of differences in terminal emulators, not all keys may function on all terminals.

### 4.3 PowerChute Configuration Parameters

During the PowerChute installation, you are asked to specify the configuration parameters for the UPS daemon. Make a note of the values you will use for your installation, paying strict attention to the restrictions required for the port you choose for the **Serial Port Name** parameter.

#### 1. Serial Port Name:

The port you specify as Serial Port Name is the serial port through which the UPS will communicate. PowerChute requires complete control of the serial port. Use a serial port that no other processes are allowed access. Be sure that the serial port is not enabled for login.

**Note:** Consult the VMS manuals for the proper names for serial devices. The port must be configured before starting PowerChute. See Section 4.1, step 4, for further information.

PowerChute requires complete control of the serial port. When PowerChute is configured, it will attempt to determine whether the port supports full modem control. On some systems, ports which support full modem control will not be recognized as such; this is normal for PowerChute. See the description of the Disable Down Time parameter later in this section for information about PowerChute operation without full modem control.

#### 2. Message Delay Time:

The message Delay Time is the number of seconds PowerChute waits after initial power failure before sending the first message to users. A low number value gives users more advance warning of impending shutdown. The default is 5 seconds.

**3. Message Interval Time:**

The Message Interval Time is the number of seconds between warning messages during a power failure. Increasing this number gives users less frequent logoff reminders; decreasing the number gives users more frequent logoff reminders. The default is 30 seconds.

**4. Disable Down Time:**

Disable Down Time lets you disable the use of the Down Timer. If the value is set to NO (the default), PowerChute automatically shuts down the system after the specified Down Time elapses or when low battery is reached. If you enter YES, PowerChute does not prompt you for Down Time and shuts down the system only upon receiving a low battery signal. If the serial port does not support modem control, the default is set to UNA (unavailable), you can not change the value, and the system shuts down only when the timer expires.

**5. Down Time:**

Down Time is the number of seconds from initial power failure until the shutdown routine is initiated. If a low battery condition is encountered before the Down Time expires, shutdown is immediate. Remember that the UPS must be able to supply power for this time for a graceful shutdown to occur. The default is 300 seconds (five minutes).

**6. Low Battery Runtime:**

The Low Battery Runtime is the number of seconds PowerChute waits before shutting down the system when a low battery condition occurs. Set this value low enough to ensure that there is sufficient time left on the battery to shut down the system after Low Battery Runtime expires.

**7. IO Timeout:**

The IO Timeout is the number of seconds PowerChute waits on an input/output operation before timing out. Set this value to at least 2 seconds (or longer for terminal server ports).

**8. Event Log File Name:**

The Event Log File Name is the full path name of the file where event log entries are stored. The default file is PWRCHUTE.LOG in the PowerChute default directory.

**9. Event Log File Size:**

The Event Log File Size is the maximum size (in bytes) to which the the event log file is allowed to grow. When this limit is reached, PowerChute flushes the oldest one-third of the log file entries from the file.

**10. Error Log File Name:**

The Error Log File Name is the full path name of the files where error log entries are stored. The default file is PWRCHUTE.ERR in the PowerChute default directory.

**11. Event Message File Name:**

Event Message File Name is the full path name of the file that defines text associated with PowerChute messages. The default file is PWRCHUTE.MSG in the PowerChute default directory.

**12. Configure Message Text:**

Configure Message Text enables you to change the text of messages broadcast to users for various events. Selecting YES displays the messages on your screen. You can then modify or delete a message. If you delete (blank out) an entire message, PowerChute broadcasts no message for the associated event.

**13. Configure Command Procedures:**

Configure Command Procedure enables you to change which command procedure files are executed in response to various events. Selecting YES displays and lets you modify the list of the executable command procedure files. (The default command procedure executable files are in the PowerChute directory, and you can modify their contents with a text editor.)

## **4.4 Verify Proper Operation**

**Note:** Run this procedure when no critical applications are in case you have not configured PowerChute correctly.

You can edit POWERCHUTE\$DIR:SHUTDOWN\_PC.COM to comment out the shutdown command so that you can test the software without any risk of shutting down the system due to incorrect configuration. When you are sure PowerChute is running correctly, remove the comment characters.

To verify that you have installed PowerChute correctly:

1. With the PowerChute process running, disconnect the AC power cord from the wall outlet. After a brief delay (i.e. the Message Delay Time), the system console and terminals accessing the system are notified that a power failure has been detected.
2. Plug the power cord back into the wall outlet. The console and terminals are notified that power is restored to the system.

3. Unplug the AC power cord from the wall outlet again. The console and terminals again receive messages that a power failure has occurred.
4. Allow the UPS system to run until either a low battery condition is reached or the shutdown timer (i.e.: Down Time) expires. The system sends a message notifying users of an impending system shut down. After a short delay all remaining users are logged off, and the system is shut down.
5. Plug the UPS power cord back into the wall outlet, and reboot the machine.
6. Check the PowerChute Log file, PWRCHUTE.LOG, to make sure that all the preceding events were recorded.

If the installation is not functioning properly even after you check your installation connections, call APC Technical Support for assistance. See the list of APC worldwide technical support centers on the inside of the back cover.

## 4.5 Removing PowerChute

PowerChute provides a command procedure you can use to remove PowerChute from your system.

If you remove PowerChute and then want to implement UPS monitoring again, you must re-install PowerChute from the installation tape or CD-ROM.

To remove PowerChute from your system, issue the following commands:

```
SET DEFAULT POWERCHUTE$DIR
@REMOVE_PC
DEASSIGN/SYSTEM POWERCHUTE$DIR
```

The REMOVE\_PC command file automatically performs these tasks:

- kills the PowerChute UPS process (PowerChute), if it is running
- removes all files in the PowerChute directory, except the event log files and the error log files

In the startup file, you must delete the line that invokes PowerChute:

## **5. PowerChute Structure**

PowerChute consists of several components. The UPS Monitoring Process (POWERCHUTE.EXE), which runs on the system in the background,



communicates with the UPS through the serial port. A log file records power events detected by the UPS Monitoring process. Command files are executed when PowerChute detects UPS events.

## 5.1 Operational Overview

Upon system boot, PowerChute starts automatically. While AC power is present, PowerChute runs in the background and waits for power events to occur. When the UPS switches to battery back-up, users receive messages informing them that their workstations are on back-up power and advising them to log off.

If utility power returns, users receive a message indicating that normal operations have resumed on the system. If the utility power is not restored, users continue to receive messages at specified intervals until either the UPS reaches low battery or the shutdown timer expires. At this point, PowerChute alerts users that the system is shutting down, logs out all users, and performs a standard system shutdown.

Additionally, PowerChute logs all power events (such as power failure, power return, and system shutdown due to extended outages or low UPS battery) to the PowerChute Log file.

### 5.1.1 UPS Monitoring Process

The UPS Monitoring Process provides the following functionality:

- Monitors the UPS for "power events"
- Executes **user-configurable** command procedures when utility power fails, utility power returns, the user-specified time interval expires, the UPS reaches low battery, or the system shutdown timer expires.
- Logs power events in the PowerChute UPS log file, such as loss of utility power, return of utility power, low UPS battery, and system shutdown.
- Records in the PowerChute log file all errors that hinder the operation of PowerChute.
- Performs an unattended secure system shutdown in the case of one or more extended power outages that cause low or exhausted UPS batteries.

The UPS Monitoring Process runs in the background and will appear as a Hibernating (HIB) process.

Following is a summary of the functionality of PowerChute when it encounters events related to utility power.

**Power Failure:**

- executes user-configurable Power Fail command procedure, which sends a message to users
- enters Power Fail information into the log file

**Power Return:**

- executes user-configurable Power Return command procedure, which sends a message to users
- enters Power Return information into the log file
- resumes normal system operations

**Low Battery (or Downtime timer expired):**

- executes user-configurable Low Battery command procedure (or timer expired command procedure), which sends a message to users
- enters Shutdown Due to Low Battery (or Battery Timer Expired) into the log file
- shuts down the system.

### 5.1.2 The PowerChute Log File

Power events are recorded in the ASCII text file, PWRCHUTE.LOG. To view this log file, use the VMS `type` command. The entries in the LOG file have the following form:

Code,	Date,	Time,	Description
200000	9/20/95	12:02:20	UPS on Battery

The first digit in the event code is the severity of the event: 1 = severe problem, 2 = warning, and 3 = informational message. See Appendix A for a complete list of power event messages.

### 5.1.3 Command Procedure Files

You can use an ASCII text editor to modify the following command procedure files in order to perform special tasks at the time of each power event. Carefully check any changes you make to these files. **Do not modify any file in the PowerChute directory unless it is on this list.**

FAIL_PC.COM	Command procedure executed when the utility power fails and the UPS switches to battery power.
RETURN_PC.COM	Command procedure executed when power returns.

TIMEEXP_PC.COM	Command procedure executed when the system shutdown timer expires.
LOWBAT_PC.COM	Command procedure executed when the UPS reaches Low Battery.
SHUTDOWN_PC.COM	Command procedure executed when PowerChute shuts down the system. <u>To customize your shutdown process, modify this shutdown command procedure.</u> If you already have a special power failure shutdown command procedure, modify SHUTDOWN_PC.COM to call it.

#### 5.1.4 PowerChute Files

Files used by PowerChute are stored in the directory you designated as your PowerChute directory when you performed Step 6.a. in Section 4.1, "Detailed Installation." Following is a functional summary of the most important of these files:

POWERCHUTE.EXE	The Server Module (UPS Monitoring Process) that runs in the background and monitors the UPS for power events.
APCSETUP.COM	Runs the configuration menu.
POWERCHUTE.INI	Contains all the PowerChute configuration information. Every time PowerChute starts, it reads this file.
POWERCHUTE.LOG	Logs the date and time of all power events such as power failure, power return, low battery, and battery timer expired. POWERCHUTE.EXE creates this file.
POWERCHUTE.ERR	Logs any errors that occur while PowerChute runs.
POWERCHUTE.MSG	Contains the text for supported events logged in the event log file.
REMOVE_PC.COM	Removes PowerChute from your system.
KILL_PROC.COM	Kills the PowerChute UPS Monitoring Process (PowerChute).

## **6.    Modifying Runtime Parameters**

The current PowerChute parameter values are stored in the PowerChute configuration file, PWRCHUTE.INI in the PowerChute directory. When the PowerChute server module starts, it reads the run-time parameter values directly from this configuration file.

You can modify these parameters by executing the following command line:

```
@POWERCHUTE$DIR:APCSETUP.COM
```

The following events take place when this command procedure runs.

1. The Server Module (PowerChute) stops, if it is running.
2. The Configuration Menu is displayed, enabling you to enter new parameters. The parameters you enter become the new defaults. To revert to the initial default parameters, delete the file POWERCHUTE\$DIR:PWRCHUTE.INI, and then execute APCSETUP.COM.
3. A new Server Module is started using the current parameters, including any changes you entered.

## **Appendix A - PowerChute Log File Entries**

The following messages are for **SEVERE** events:

### **UPS Battery Is Discharged**

This event is triggered when the UPS reports a low battery condition while the UPS is on-line.

The following are **WARNING** messages:

### **UPS on battery**

The UPS has switched to battery backup because of low utility line voltage.

### **System shutdown**

This event is triggered when PowerChute begins system shutdown due to loss of utility power for an extended period of time. If a reason for the shutdown is known, a more specific event is logged.

### **System shutdown: battery run time expired**

This event is triggered when PowerChute begins system shutdown because of a utility power outage exceeding the duration specified in the *downtime* parameter of the PWRCHUTE.INI file.

### **System shutdown: Low battery condition**

This event is triggered when PowerChute begins system shutdown due to the UPS entering the low battery state when on battery.

### **Low Battery Warning**

The UPS battery is near its low voltage shutoff threshold.

The following are **INFORMATIONAL** messages:

### **\*\*\*PowerChute started\*\*\***

This event is triggered when the PowerChute software is started.

### **\*\*\*PowerChute stopped\*\*\***

This event is triggered when the PowerChute software is stopped.

### **Normal power restored: UPS on line**

This event is triggered when the UPS returns to utility power.

### **UPS returned from low battery condition**

This event is triggered when the UPS returns from the low battery condition.

## **Appendix B - Installation Troubleshooting**

<b>Problem</b>	<b>Solution</b>
The system indicates that it is on battery immediately upon starting the PowerChute process.	<ul style="list-style-type: none"> <li>- Make sure you have identified the correct port.</li> <li>- Verify that the cable is connected firmly to the correct port.</li> <li>- Make sure your terminal server port is set to REMOTE ACCESS.</li> </ul>
A message repeatedly appears on the output device, stating that the system is on battery back-up. That message is closely followed by a power restored message.	<ul style="list-style-type: none"> <li>- The I/O timeout value may need to be increased.</li> <li>- Make sure the port is set with PASTHRU.</li> <li>- Make sure the port is set to NOBROADCAST.</li> </ul>
PowerChute stops immediately or soon after being run.	Check the file POWERCHUTE\$DIR:PWRCHUTE.ERR for an error message describing the problem.
The Configuration screen is not properly aligned	In the terminal setup, under screen characteristics ensure that "Column tabs = 8".
You do not have the cabling necessary to connect your UPS to an RJ-45 terminal port.	DEC manufactures a conversion cable from RJ-45 to 25 pin RS-232. The DEC part number is: <b>H8585-ab</b> . In addition, BN24J-01 may be required from DEC.
You do not have the cabling necessary to connect your to an MMJ-45 terminal port	DEC manufactures a conversion cable from MMJ to to 25 pin RS-5232. The DEC part number is: <b>H8575-d</b> .
The PowerChute process does not start or does not respond to power events.	<ul style="list-style-type: none"> <li>- Make sure that terminal characteristics for the port are correct. See Section 4.</li> <li>- Make sure the software was installed using the SYSTEM account. See Section 6.</li> <li>- Make sure the correct adapters are used for connection to RJ-45 or MMJ-45 ports. See Section 5.</li> </ul>